

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Washington 25, D. C.

Reserve

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To: All Regional Construction Engineers

From: J. K. O'Shaughnessy, Chief
Engineering Division

Subject: Estimating Cost of Construction

The attached tables were prepared to assist you in estimating the costs of constructing lines when analyses are made of the construction budget, as well as for checking the master budget of new allocations. By means of the factors given in these tables, the increase in average cost of a mile of line may be obtained for any percent increase in cost of any one of the component groups of materials used in an average mile of line.

The lower block of each table gives the average total cost and percentages of material and of labor. These are average costs per mile and include about 20% multiphase lines.

Table No. I is based on average costs of material, labor and other in effect January 1946, and Table No. II is based on increased material costs in effect November 9, 1946, without change in labor and other costs except for a small increase in freight.

Both tables give information for different types of conductor in each of the three loading districts from which a comparison of costs may be made for the respective conductors used in construction.

The factors in the tables when multiplied by the applicable percent increase for the group and the average cost per mile of the project under consideration will give the dollar amount increase per mile. The ratios of material and of labor and other to total cost should be approximately those shown in the tables. The following table gives the percent increase for the several groups in effect as shown:

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	As of 11/9/46 over Jan. 1946	As of 1/1/47 over Jan. 1946	As of 1/1/47 over Nov. 9, 1946
	Base	Base	Base
	(1)	(2)	(3)
Poles	-	-	-
Hardware	15	25	10
Grounds	48	62	8
#4 7/1 ACSR	10	18.5	8
6A	41	49	5
8A	37	42	4
6 SCG	24	38	12
8 SCG	22	36	11
6 HD	49	62	8
Serv. Wire	36	52	8
Transformer	21	27	5
Clearing	-	-	-
Freight	9	25	13

Total Materials:---

Conductor Type	(1)			(2)			(3)		
of Line	Heavy	Medium	Light	Heavy	Medium	Light	Heavy	Medium	Light
#4 ACSR 7/1	12	12	13	20	19	21	5.3	5.5	5.8
6A & 8A	21	22		27	27		4.6	4.8	
6 SCG & 8 SCG			17			26			7.3
6 HD			23			31			5.9

Current changes in material prices will be available in the Cost Analysis Section.

Attached are two sheets containing information on pole prices and comparative percent increases. Pole prices are treated separately because of the wide variations according to species and location. Confidential prices on other kinds of poles not shown in the attached lists are available in the Cost Analysis Section.

In order that an approximation of delivered prices may be calculated from the f. o. b. plant quotations, a compilation of freight rates to various points is being prepared which will be available shortly.

Only the percent increases of poles f. o. b. plants should be used when applied to the tables of factors as that is the basis on which the factors were calculated.

EXAMPLES:

I. To illustrate the use of the factors, assume that a construction budget exclusive of substations, etc., was established on the basis of costs in effect January 1946, under which the average cost for material,

labor and other, per mile was \$1100; #4 A CSR 7/1 conductor, heavy loading district. It is desired to estimate the cost of the line construction as of November 9, 1946.

From Table I, item "Total Material," the factor is .00490. The percent increase for total materials, from column (1) above is 12. Then:

$$\begin{array}{rcl}
 (1) & .00490 \times 12 \times \$1100 & = \$64.60 \text{ material cost increase} \\
 (2) & .000299 \times 9 \times \$1100 & = \underline{3.30} \text{ freight cost increase} \\
 & & 67.90 \text{ total increase} \\
 (3) & & \underline{1100.00} \text{ total cost January 1946} \\
 & & \$1167.90 \text{ total cost November 9, 1946,} \\
 & & \text{or 6\% increase}
 \end{array}$$

NOTE: Member density need not be taken into account since the ratio of total material to total cost remains approximately the same.

II. Assume an average cost for material, labor and other, per mile was \$1400, #6A and #8A conductor, medium loading district. The estimated increased cost is to be obtained for line construction as of January 1, 1947, over the cost on November 9, 1946.

From Table II, item "Total Material," the factor is .00538. The percent increase for total materials, from column (3) above is 4.8. Then:--

$$\begin{array}{rcl}
 (1) & .00538 \times 4.8 \times \$1400 & = \$36.10 \text{ material cost increase} \\
 (2) & .00255 \times 13 \times \$1400 & = \underline{4.65} \text{ freight increase} \\
 & & 40.75 \text{ total increase} \\
 (3) & & \underline{1400.00} \text{ total cost November 9, 1946} \\
 & & \$1440.75 \text{ total cost January 1, 1947,} \\
 & & \text{or 3\% increase}
 \end{array}$$

III. There will be cases where the cost increase of individual groups is to be evaluated, as for instance:--average cost per mile \$1200 on November 9, 1946, base; #6 HD conductor; light loading district. The cost of poles has increased 10% over November 9th, and hardware an additional 5% over present price, or 15.5% over November 9th. To find increased cost per mile as of January 15, 1947:--

From Table II, factor for "Total Material" is .00585; for poles .00132; for hardware .000884. Increase for total materials, column (3), as of January 1, 1947, is 5.9.

$$\begin{array}{rcl}
 (1) & .00585 \times 5.9 \times \$1200 & = \$41.40 \text{ material cost increase Jan. 1, 1947} \\
 (2) & .00255 \times 13 \times \$1200 & = 4.00 \text{ freight increase, Jan. 1, 1947} \\
 (3) & .00132 \times 10 \times \$1200 & = 15.80 \text{ pole increase, Jan. 15, 1947} \\
 (4) & .000884 \times 5.5 \times \$1200 & = \underline{5.84} \text{ hardware increase, Jan. 15, 1947} \\
 & & 67.04 \text{ total increase, Jan. 15, 1947} \\
 & & \underline{1200.00} \text{ total cost Nov. 9, 1946} \\
 & & \$ 1267.04 \text{ total cost Jan. 15, 1947 or} \\
 & & 5.5\%
 \end{array}$$

IV. When the cost of construction is to be analyzed for a project for which there is a labor only construction contract or bid, the cost of materials plus handling and overhead by the borrower must be considered. It should be kept in mind that the costs obtained from a Standard Mile, Form DS-191, are not for a complete mile as all units are not listed. Tables I and II are based on total costs of average miles and the ratios of material, labor and other, to the total cost shown in those tables must be approximated by the ratios of the mile of construction being analyzed. If the ratios do not correspond, an adjusted total cost per mile should be calculated for use with the factors. This may be done with sufficient accuracy by dividing the total estimated cost of material per mile by the percent ratio for material given in Tables I and II.

For example:--

Assume total material costs per mile of \$600 for a #4 ACSR line, medium loading district, and price base of November 9th. From Table II, the total material is 50% of the total cost and the adjusted cost per mile would be $\frac{\$600}{.50}$ or \$1200. This figure may then be used with the factors and percent increase of materials for determining increased costs.

Attachments

TABLE I

FACTORS FOR EVALUATING COST OF LINE CONSTRUCTION
(Materials, Labor & Other)

BASE - JANUARY 1, 1946

	HEAVY LOADING		MEDIUM LOADING		LIGHT LOADING		
	4 ACSR	6A - 8A	4 ACSR	6A - 8A	4 ACSR	6 HD	6SCG-8SCG
Poles	.00170	.00153	.00141	.00128	.00129	.00148	.00127
Hardware	.000831	.000781	.000811	.000754	.000920	.000870	.000836
Grounds	.000212	.000205	.000189	.000178	.000192	.000191	.000174
4 ACSR 7/1	.00101		.00108		.00130		
6 A		.000933		.000968			
8 A		.000561		.000584			.00114
6 SCG							.000660
8 SCG							
6 HD						.00143	
Service Wire	.000165	.000159	.000176	.000166	.000212	.000197	.000192
Transformers	.000983	.000948	.00105	.000986	.00126	.00117	.00114
Clearing	.000425	.000409	.000578	.000544	.000514	.000479	.000467
Freight	.000299	.000296	.000243	.000229	.000262	.000313	.000284
Total Material	.00490	.00512	.00472	.00491	.00517	.00535	.00541
Total Labor	.00510	.00488	.00528	.00509	.00483	.00465	.00459
Material/Mile	\$623	\$675	\$563	\$623	\$513	\$569	\$591
Labor*/Mile	\$648	\$644	\$631	\$645	\$479	\$495	\$501
L* end M/Mile	\$1271	\$1319	\$1194	\$1268	\$992	\$1064	\$1092
% Labor*	51	49	53	51	48	47	46
% Material	49	51	47	49	52	53	54

*Labor and Other

Construction Cost Analysis Section

January 1, 1947

TABLE II

FACTORS FOR EVALUATING COST OF LINE CONSTRUCTION
(Materials, Labor & Other)

BASE - NOVEMBER 9, 1946

	HEAVY LOADING		MEDIUM LOADING		LIGHT LOADING	
	4 ACSR	6A - 8A	4 ACSR	6A - 8A	4 ACSR	6 HD 6SCG - 8SCG
Poles	.00160	.00138	.00133	.00115	.00120	.00132 .00115
Hardware	.000909	.000807	.000873	.000779	.000988	.000884 .000876
Grounds	.000296	.000273	.000259	.000234	.000263	.000250 .000234
4 ACSR 7/1	.00104		.00111		.00133	
6 A		.00118		.00123		
8 A		.000697		.000722		
6 SCG						.00129
8 SCG						.000734
6 HD					.00189	
Service Wire	.000214	.000198	.000228	.000205	.000273	.000242 .000242
Transformers	.00112	.00103	.00119	.00107	.00142	.00126 .00126
Clearing	.000399	.000369	.000542	.000489	.000480	.000425 .000425
Freight	.000318	.000294	.000275	.000255	.000263	.000300 .000284
Total Material	.00517	.00557	.00498	.00538	.00548	.00585 .00579
Total Labor	.00483	.00443	.00502	.00462	.00452	.00415 .00421

Material/Mile	\$700	\$815	\$634	\$760	\$583	\$701	\$694
Labor*/Mile	\$653	\$648	\$638	\$652	\$481	\$498	\$505
I* & M/Mile	\$1353	\$1463	\$1272	\$1412	\$1063	\$1199	\$1199
% Labor*	48	44	50	46	45	42	42
% Material	52	56	50	54	55	58	58

*Labor and Other

Construction Cost Analysis Section
January 1, 1947

MARKET PRICES F.O.B. PLANT - TREATED POLES
(November 9, 1946 & January 1, 1947)

Class & Length ---		November 9, 1946			January 1, 1947		
		7-30	7-35	6-35	7-30	7-35	6-40
SOUTHERN YELLOW PINE							
<u>8 lb. Pressure-Treated</u> <u>(19 Quotations)</u>							
<u>Average Price</u>							
Southeastern Zone <u>1/</u>	\$7.48	\$10.21	\$11.43	\$14.13	\$8.33	\$11.42	\$12.69
Central Zone <u>2/</u>	7.82	10.51	11.62	14.23	8.59	11.55	12.87
Southwestern Zone <u>3/</u>	7.97	10.78	12.10	15.02	8.81	11.92	13.41
Average--All 3 Zones	7.71	10.45	11.67	14.41	8.54	11.57	13.33
<u>Range of Prices</u>							
Southeastern Zone	6.69- 9.30	9.06- 12.45	10.22- 13.95	12.73- 17.45	7.66- 9.83	10.44- 13.87	11.80- 14.78
Central Zone	7.10- 8.98	9.675- 11.77	10.875- 12.28	13.50- 14.95	7.41- 10.20	10.025- 13.22	11.315- 14.29
Southwestern Zone	7.65- 8.82	10.41- 11.96	11.675- 13.42	14.50- 16.62	8.50- 9.76	11.49- 13.22	12.88- 14.84
All Three Zones	6.69- 9.30	9.06- 12.45	10.22- 13.95	12.73- 17.45	7.41- 10.20	10.025- 13.87	11.315- 14.84
DOUGLAS FIR - WEST COAST <u>4/</u>							
<u>8 lb. Pressure-Treated</u> <u>(5 Quotations)</u>							
<u>Average Price</u>		9.26	12.405	14.135	16.95	9.26	12.405
<u>Range of Prices</u>		9.00- 9.60	12.125- 12.825	13.875- 14.575	16.65- 17.45	9.00- 9.60	12.125- 12.825

- 1/ North Carolina, South Carolina, Georgia, Florida
2/ Alabama, Mississippi
3/ Louisiana, Texas, Oklahoma
4/ Washington, Oregon, California

INDEX OF TREATED POLE PRICES F.O.B. PLANT

November 1946 - January 1947

(11/9/46 = 100)

Class and Length -----	November 9, 1946				January 1, 1947			
	7-30	7-35	6-35	6-40	7-30	7-35	6-35	6-40
SOUTHERN YELLOW PINE								
<u>8 lb. Pressure-Treated</u>	100	100	100	100	111	112	111	111
<u>Southeastern Zone 1/</u>	100	100	100	100	110	110	111	110
<u>Central Zone 2/</u>	100	100	100	100	110	111	111	110
<u>Southwestern Zone 3/</u>								
Average of Above Zones	100	100	100	100	111	111	111	110
DOUGLAS-FIR								
<u>8 lb. Pressure-Treated</u>	100	100	100	100	100	100	100	100
<u>West Coast 4/</u>								
LODGEPOLE PINE								
<u>8 lb. Pressure-Treated</u>	100	100	100	100	102	104	104	106
<u>Colorado</u>								
<u>Non-Pressure, Full-Length</u>	100	100	100	100	108	113	112	109
<u>Montana</u>								
<u>1" Butt-Treated</u>	100	100	100	100	125	121	122	121
<u>Montana-Idaho</u>								
WESTERN RED CEDAR								
<u>1" Butt-Treated</u>	100	100	100	100	105	102	105	105
<u>Idaho</u>								

- 1/ North Carolina, South Carolina, Georgia, Florida
- 2/ Alabama, Mississippi
- 3/ Louisiana, Texas, Oklahoma
- 4/ Washington, Oregon, California

